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ABSTRACT

This paper explores whether or not sociology may be integrated into courses on technology and values at the college level. Sociologists are interested in collaborating with scientists and engineers because many of the most urgent social issues of the late 20th century seem to lie at the interface of social values and technological change. The authors first describe the technology and human values courses they are teaching at the University of Lowell in Massachusetts. The courses are taught by an interdisciplinary team consisting of sociologists, historians, a scientist, and an engineer. A three-week summer workshop was held for the teaching team. Students meet three times a week, twice in large lecture sessions and once in small discussion groups. All the instructors lecture at intervals throughout the course and attend each others' lectures. To illustrate the case study approach used in the course, the authors describe and examine two specific case studies covered: "Einstein, Relativity and the Sociological Imagination" and "Energy Choices and the Analysis of Social Values." The authors state that student evaluations indicate a significant increase in the sociological consciousness of many students. In the concluding section of the paper, the authors offer some suggestions for improving the course content and the pedagogical style that (1) the faculty spend less time in formal workshops and more time in informal discouse with one another; (2) lectures should contain less detail; (3) the scientists and engineers should reduce the amount of technical exposition and increase the time spent on analyzing social contexts and value choices; (4) the sociologists need to do a better job spelling out how the application of sociological concepts and data sheds valuable light on the content and source of values and on how to make intelligent policy choices; and (5) the small group discussions need to be improved. (Author/RM)

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# TEACHING WITH ENGINEERS AND SCIENTISTS:

# WHAT ROLE FOR SOCIOLOGY?

SO 013 199

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Paper to be presented at the annual meeting of the American Sociological Association, New York, August 1980.

TITLE: TEACHING WITH ENGINEERS AND SCIENTISTS:

WHAT ROLE FOR SOCIOLOGY?


ABSTRACT

An analysis of the problems of inculcating a sociological perspective in interdisciplinary policy-related courses. As a case-study, courses on technology and human values at a medium-sized state university are described. These courses are taught by an interdisciplinary team consisting of sociologists, historians, a scientist and an engineer. Special reference is made to techniques for teaching social aspects of modern physics and energy choices. In teaching these courses, it was found easier to teach specific concepts regarding sociology and technology, than to develop a sociological imagination for application in understanding the relations between technology and values. A key device in alleviating this problem is the small discussion section, and suggestions are offered for increasing both the interest level and the intellectual rigor of those sections.



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## I. INTRODUCTION

At the present time, many sociologists are interested in interdisciplinary teaching, including work with colleagues in scientific and technological disciplines. One reason for the interest in such work is that many of the most urgent social issues of the late twentieth century seem to lie at the interface of social values and technological change. Another more mundane motivation behind the eagerness of sociologists to work with engineers and scientists is that such collaboration will improve the career prospects of sociologists in an increasingly bleak job market.

The authors of this paper are members of a faculty team teaching undergraduate courses in Technology and Human Values at a medium-sized state university. The courses are team-taught, and the other team members are historians, a mechanical engineer and a physicist. The question we wish to explore is: how may sociology be integrated into courses on technology and values, in ways that both maximize the amount of sociological material learned by students, and still give students sufficient grasp of the empirical details and the value choices about technologies that the other instructors present?

The primary reason we week answers to this question is that we desire to be effective as teachers, communicating to our students the sociological concepts and value issues involved. However, discussion of our subject area will also help us to be effective colleagues and productive researchers. For when we are clear in our own minds about the questions and ideas to present to students, we are in a better position to ask meaningful questions of our colleagues in other disciplines, and to formulate manageable and significant research questions.

In section II of this paper, we describe in detail the courses we have been teaching. We then in section III discuss the main problem of integrating sociology with other disciplines, and the techniques we have adopted so far. We focus in section III on the particular topics we have taught in our courses on Technology and Human Values at the University of Lowell in Massachusetts. What we have learned should be of interest to sociologists teaching other policy-related or interdisciplinary courses. In the concluding section, we offer some suggestions for improving the course content and the pedagogical style, that should be helpful to others teaching similar courses.

## II. TECHNOLOGY AND HUMAN VALUES COURSES AT THE UNIVERSITY OF LOWELL

The University of Lowell is a state institution with approximately 7000 full-time day students. Most of its students are professionally oriented, and the most popular majors are in engineering, management and health-care. The majority of students commute to their classes, and come from working-class backgrounds.

During the academic year 1977-78, The National Endowment for the Humanities provided a Pilot Grant which helped us develop two new freshman-sophomore level interdisciplinary humanities courses: Technology and Human Values I and II. These core courees were team taught by faculty representing the disciplines of sociology, history, philosophy and political science. These courses explored the various facets of humanities' relationship to technology throughout the course of history as well as in contemporary societies. From the perspective of each discipline we explored the mechanisms, contexts and consequences of technological growth and how changes in the technological environment effect revisions in human values and self images, and how in turn the frameworks of

meaning generated by the human spirit can serve to reorganize technological structures and infuse them with new values.

Technology and Human Values I dealt with technology and the transformation of values during significant historical periods ( e.g., the Middle Ages, the Scientific Revolution). Technology and Human Values II focused on contemporary challenges such as the impact of technology on the modern family.

Given the success of these two introductory courses - they were adopted as part of the core curriculum of the University - we decided to expand our program to add scientists and engineers to our teaching teams. The enlarged program will culminate in a new interdisciplinary Technology and Culture-minor at the school. In addition to the core courses Technology and Human Values I & II, the minor will include a two-semester seminar in which upper-division students work closely with a humanist and scientist or engineer on detailed research projects. These projects will relate to the topics of the basic Technology and Human Values courses, and will allow students the opportunity to carefully design projects, collect data, and present their findings orally and in writing. Another part of the minor will be courses on related topics. For example, courses currently taught at Lowell include Technology and Society, and Population Resources and Environment ( in the Sociology Department); Environmental History (in the History Department); Women and Technology (in the Political Science Department); and Industrial Lowell (another interdisciplinary course).

With these innovations in mind, we applied for and received a three-year Development Grant from The National Endowment for the Humanities to run from 1979 to 1982.

In order to integrate the approaches scientists and engineers will bring to the content of the courses which had previously been taught only by humanists, a preparatory three week summer workshop was held in June 1979. During the workshop we met with consultants who were eminent scholars in fields we would draw upon for our course content. In addition, the previously used syllabi were revised to accommodate the interests of the scientists and engineers. This revision proved to be a formidable task.

One of our initial concerns was to prevent fragmentation of subject-matter in our technology and human values courses. Largely to alleviate this problem, the following format was used. a) Students met twice weekly in large lecture sessions. Each instructor was responsible for a block of lectures, but also attended all lectures by the other instructors. b) In addition, one class meeting a week was allocated to small discussion sections , each led by one member of the teaching team. c) There were also question and answer sessions once or twice in the semester. In b) and c), faculty encouraged students to integrate course material by asking provocative questions and offering brief integrative comments of their own.

The courses were taught in two large sections, one on the campus of a former technological institution, and the other at a former state college (these two schools were merged in 1975 to form the University of Lowell). On each campus, the teaching team consisted of a historian, a sociologist, and a scientist/engineer. The class occasionally went on field trips (e.g. to the Lowell Museum, as part of a unit on the Industrial Revolution), saw movies (e.g. Jacob Bronowski's "Knowledge of Certainty" from the Ascent of Man series, to raise questions about the philosophical principles and value implications of modern quantum physics), and heard from guest lecturers (such as Ruth Hubbard of Harvard, on recombinant DNA as a major instance of

contemporary biological revolutions). These "non-routine" activities helped greatly in expanding the scope and interest level of the courses -- but they perhaps posed further problems of integration.

Rather than presenting a global history of technology, or starting from key analytical concepts, we focused in both courses on certain case-studies. This approach is of intrinsic interest to freshman and sophomores, and encourages a deeper understanding of the interaction between technology and values. At all times, we select case examples that are of pressing concern to large numbers of people, such as energy, food and warfare. In 1977-78, we organized the topics so that the technological changes were covered in the approximate chronological order of their occurrence. But in 1979-80 we have organized our case studies differently: in the fall we focus on those technologies whose main purpose is to improve humans' relationships with nature, while in the spring we discuss those technologies and their impacts which mainly involve humans' relations to each other.

Thus we do not offer a "semi-interdisciplinary" course, where one entire unit is taught by, for example, an engineer and then another unit by a social scientist. Rather, in all sections of our Technology and Human Values courses, all the instructors always attend each others' lectures, lecture at intervals throughout the course, and teach explicitly about the social and value correlates of the subject matter. The format of our courses makes more strenuous demands on the instructors - and perhaps on students too than that of semi-interdisciplinary courses, but by the same token our format forces all concerned to learn much more about each other's disciplines.[1]

## III. INTEGRATING SOCIOLOGY WITH OTHER DISCIPLINES

When sociologists try to understand and evaluate technologies, they make two generic assumptions, whether they be functionalsists, Marxists, symbolic

interactionists, etc. First,they assume that technological stability and change result at least in part from the workings of social systems ( which can be of various sizes, ranging from families and other primary groups to all humankind. In addition, they may have different levels of complexity such as modern universities vs. medieval apprenticeships; and different forms of inequality such as those based on class vs. caste). Second, sociologists assume that people's beliefs and values are considerably influenced by their location in social systems. This assumption must be spelled out when we describe and explain the origins of values and their impact on technologies.[2]

It is not easy for a sociologist working alone to teach these two assumptions. When the sociologist team-teaches with scientists and engineers, he/she faces two further problems - which we found intractable in our Technology and Values courses. First, how much sociology do our students - and our non-sociological fellow-instructors - need to know, given that they must also acquire a grasp of selected basic scientific and engineering concepts as well as a sense of the historical past and of long-run historical trends? Second, how can we lay bare the - often implicit-social and value implications of specific scientific theories and technological changes?

There is an extensive literature on the social and value aspects of science and technology in general, and of scientific disciplines and broad technological trends (e.g. Kuhn, 1962, Mumford, 1934; Polanyi, 1966). But these broad analyses are too abstract and too technical for freshmen and sophomores, especially since we focus on a few empirical cases rather than theoretical analyses. When we look at specific developments in science and technology such as those involving energy and food production, the existing social-science literature usually fails to cover important sociological topics. For example, our text on energy is Commoner's The Poverty of Power (1976). This book provides a lucid and comprehensive introduction to pressing energy concerns.

But even so, we must go to great lengths to explain Commoner's socioeconomic analyses of energy policies. Another part of our role is to supplement Commoner with other social scientists' concepts and data that relate significantly but sometimes indirectly to energy issues (e.g. Domhoff, 1967; Engler, 1978; Flink, 1977).

We will now examine two specific case-studies that we covered in the Technology and Human Values I course in Fall 1979.

A. Einstein, Relativity and the Sociological Imagination

The topic of the twentieth-century scientific revolution initially inspired fear in many of our students. The physicist on our team spelled out details of the revolution, using as the text his own very readable book, Modern Physics and anti-Physics (Baker, 1972). He focused especially on the special theory of relativity, and how Einstein upset Newton's assumption of absolute space and time. The teaching team had considerable success in teaching the specific concepts and theorems Einstein introduced. This change in legitimate experts' view of a particular aspect of reality led to broader changes in lay people's and other disciplines' views on other aspects of reality. An example of this in the case of relativity theory was the spread to many areas of thought of the assumption that the universe must be understood in relativistic and probabilistic terms. This assumption is related to contemporary sociology's rejection of ethnocentrism and replacement of it with a view that all cultures' perspectives are relative. All of these ideas proved quite easy to communicate to our students. However, a much harder task was to encourage our students and our colleagues to utilize a sociological imagination in uncovering the social factors that influence changes in cognitive worlds (cf. Mills, 1959). For example, we tried without much success to get our students to find answers to the following questions about the Einsteinian revolution

in physics: how did scientists' and lay persons' general cognitive world change, once they became familiar with Einstein's findings? How close were the links between wider social groups and the scientists/engineers who followed up Einstein's work? Which social groups had most power over the dissemination and application of Einstein's theories and thus influenced those ideas which are most widely known and practiced today -- for example, what was the role of the military in promoting particular applications of modern physics, to the point where the development of the atom bomb became feasible?

We do not expect our students to arrive at definitive answers to questions like these. But it is important that they formulate and operationalize them. Students should also be encouraged to draw on their knowledge of comparable cases. In our course for example, the discussion of Einstein was preceded by lectures by the historians on the classical scientific revolution of the fifteenth, sixteenth and seventeenth centuries. While covering this topic, the instructor pointed out that by the seventeenth century, science was becoming useful to the emerging nation-states of Europe. A sociologically imaginative students was able to use this knowledge about Newton and his contemporaries, and apply it in analyzing the relationships between Einstein's findings and the subsequent development of the atomic bomb. We acknowledge the difficulty of eliciting such a sociological perspective from students who have in most cases had little prior exposure to the social sciences, and whose interest is almost always confined to contemporary events. But we did attempt to push students into raising and answering questions about the social consequences of technological changes. We think this is a very important part of the sociologist's role in a course of this sort.

B. Energy Choices and the Analysis of Social Values

We had students study current energy-policy alternatives, as another

of our special cases. The engineer on our team introduced modern engineering concepts, especially the laws of thermodynamics and the measurement of thermodynamic efficiencies. As with the case of the modern scientific revolutions, many of the students were at first frightened by thermodynamics. However, students did develop a reasonably competent grasp of the topic.

As in the discussion of the scientific revolutions, we found it hard to inculcate a sociological perspective on energy. We wanted students to clarify their and other groups' values and policy positions regarding energy, to analyze why there are energy shortages, and to understand the connections between certain basic engineering principles and policy choices.

The engineer on our teaching team discussed how the second law of thermodynamics provides a powerful tool of social analysis. This law states that entropy is constantly growing in the universe. It is "designed to show how we can maximize the amount of work, the power, the value, that can be gotten out of a given amount of energy." (Commoner, 1976: 26). Once we have calculated the second-law efficiencies of alternative energy sources and uses, such as solar vs. nuclear or cars vs. trains, we can compare these sources and uses' social desirability. These can be calculated not only according to their economic costs, but also according to their contribution to energy waste as measured by second-law efficiencies.[3]

As sociologists, we also want students to be aware of the frequent conflict between the social needs for energy, and private interests which have stakes in particular types of energy. A useful example of this conflict is provided by the history of the special interests and institutions that developed around the automobile. We lecture on this topic in some detail (cf. Flink, 1977).

We strongly encouraged our students to perform analyses such as those mentioned above, since these analyses serve to integrate sociological and physical-science knowledge. Unfortunately this endeavor met with little success.

Students rarely got far beyond saying "we Americans must change our lifestyles". Few of them asked whether our present lifestyles are the result of a) long-standing values or of b) corporate influence over housing design and road construction. Again, students often said "we have become too dependent on OPEC", without asking whether major oil companies benefited from oil price increases as much as OPEC governments, or whether international economic interdependency brings benefits to Americans such as cheaper consumer goods, that might outweigh the costs of inflation and the exploitation of foreign workers.

C. Teaching Techniques

We have used four main pedagogic techniques, in order to raise students' level of sophistication in social analysis.

1. Lectures. In the introductory lectures, students were introduced to rudimentary sociological concepts such as culture and power. Since time was limited, we could not elaborate on these concepts. However, we did constantly refer back to basic concepts and assumptions in our later lectures. For example, the concept of power was applied to the impact of agribusiness when the topic was food scarcity, and to ologopolies' control over the distribution and form of energy resources. With regard to both agribusiness and energy-producing companies, we analyzed both their market and non-market sources of power - non-market sources included such factors as advertising resources, and influence over government policies. We feel it is pedagogically effective to shift back and forth between abstract concepts and their empirical applications.

2. Discussions (both in the weekly small groups and in question-and-answer periods during lectures ). Whenever discussion took place, we tried to ensure that students understood the basic social-science and physical-science ideas involved. We probed the superficial generalizations offered

by students, and encouraged them to spell out and (at least tentatively) answer any questions they raised. Some of our - and some students' - probing questions have already been mentioned. We found that social and value aspects of technologies and technological/scientific change are often well analyzed through the device of asking students what they would recommend when a difficult policy decision must be made. When the whole class was discussing an issue, quite often the engineer or the scientist was able to spell out from his own experience specific social and value implications of some technology or scientific finding, for example, how much freedom of maneuver an ecologically-oriented engineer might have if he/she worked for a company that made polluting or energy-intensive products. These sorts of comments were very valuable for the students (and for us sociologists!), and are one of the major payoffs of a truly interdisciplinary course.

3. Exams (see examples in Appendix ). In our exams, we tested students' knowledge about specific technological and scientific theories and concepts. We found students did quite well at this. But when we also asked for analyses of the social and value correlates of those theories and concepts, students did less well - partly, we believe, because students had not been taught enough of the relevant social-science material. This weakness reflects our inability to inculcate a sociological imagination in analyzing technological issues (which is discussed above).

4. Faculty cross-fertilization. This was, obviously, a set of processes and devices for the education of the instructors rather than the students, but we think interaction among the faculty definitely improved the quality of our teaching; and is essential for the success of any interdisciplinary course. There were numerous after-lecture discussions among the faculty, and in spring 1980 there will be regular faculty meetings every other week to discuss substantive issues. Perhaps the most important channel of communication among

the teaching staff is the yearly three-week workshop which follows the spring semester. At the workshop, the faculty has a chance to discuss in detail course topics and how to structure and implement them. Through the use of consultants faculty can plug important gaps in their knowledge of major topics (such as appropriate technology and disarmament). Through all these discussions, we learn not only the manifest content of each other's disciplines, but also about the latent values, assumptions and informal social organization of each discipline.

How successful were these four sets of techniques? Probably the most successful were the first and the fourth. Even these were not completely effective. In particular, our lectures had serious weaknesses. The scientists and engineers should reduce the amount of technical exposition and increase the time spent on analyzing social contexts and value choices. More relevant to the present paper is our failure as sociologists to spell out how the application of sociological concepts and data sheds valuable light on the content and sources of values, and on how to make intelligent policy choices. Preliminary analysis of the student evaluation forms used for the Fall 1979 course suggests that fragmentation of lectures and lack of integration in the readings was perceived as a serious problem.

These considerations illustrate an important question that must be constantly faced in the process of understanding and evaluating technologies and scientific findings, namely, how much do we need to know? We need to answer this question as citizens making and monitoring policy decisions. We also need to answer such questions when we decide how much our students need to know. An important consideration in deciding how much detail to teach is that we should impart to students the ability to intelligently ask new questions that go beyond course material and the statements made by scholars and organizations.

Returning to pedagogical techniques, we feel that our greatest general failure in the Technology and Human Values courses is our inability to inculcate sociological rigor and imagination in the small-group discussions. We found this a particularly serious and yet problematic failure, because it is easier to improve lectures than discussions, and because for most students a good oral analysis is a necessary (but of course not sufficient!) condition of a good written analysis. We did require that all students in our discussion groups orally summarize and comment on a specific set of readings at least once in the semester. This was a helpful, but not wholly adequate way for students to attain a more sophisticated level of analysis.

Before concluding this section, we wish to make two further points. First, an additional important role for sociology is to integrate all the course material in a systematic way. History and engineering tend in their different ways to look at the problems and achievements of particular technologies; and even the basic physical sciences, while general in scope, tend to look at only one aspect of nature (such as interdependencies between living organisms in the case of ecology). Sociology on the other hand has a long tradition of raising such general and fundamental questions as: how are all values influenced by technological change? How and why do different types of technology change? We were especially aware of sociology's integrative role in the spring 1980 course. That semester we chose four case-studies: the industrial revolution, the impact of modern physics on computers and nuclear weapons, the family's relationship to technology, and biomedical revolutions. (See Appendix). A major/theme linking these topics is the relationships of humans to each other, and how technologies affect those relationships or are designed to alter those relationships. The task of articulating this theme fell mainly to the sociologists on the teaching team.

Second, we wish to note some positive achievements. Judging from the preliminary analysis of the student evaluation forms used in Fall 1979, many liberal arts students were gratified at their ability to master technical material. Engineering students in turn were intellectually challenged by the historical and sociological material. Clearly, there was a significant increase in the sociological consciousness of many students.

As faculty members, we learned an enourmous amount from the intense interaction with non-sociological colleagues. We profited greatly from the challenges to our intellectual boundaries and to our narrow range of knowledge. We learned to better appreciate the complexity of the problems wrought by technological changes. Our previous stereotypes of scientists and engineers were destroyed as we together probed the links between technology and values.

## IV. HOW TO IMPROVE THE INTEGRATION OF SOCIOLOGY

To some extent, our students' sociological naivete is reflected in the continuing gulf separating the entire cultures of science and the humanities. (Snow, 1959). Many liberal-arts students are afraid to tackle scientific and engineering concepts, and express anger at the supposed callousness and arrogance of scientists and engineers. On the other hand, students majoring in scientific and technological fields often think social science is "just common sense", and that specialists in the humanities are "soft-headed" and "unaware of the real world". These attitudes are part of the general sub-cultures of science and the humanities. They are deeply rooted in many educational institutions. They are perhaps especially prevalent at the University of Lowell, since this institution originated in the merger in 1975 of a technological institute and a state college that had not previously been on the best of terms.[4] If we are to change these attitudes and to bridge the gap between the two cultures, students and faculty in both cultures must work diligently together.

This obviously requires time. In programs such as ours at Lowell, faculty will narrow the culture gap as they get to know each other better, and students will begin to understand both cultures if they take several courses in the field of technology, society and values. At Lowell, we plan after three years to introduce a University Minor in Technology and Human Values, as we mentioned in Part II. We believe that this will lead to at east some of our students and colleagues acquiring a firmer grasp of both scientific and humanistic concepts, assumptions and values. In general, we think the best way to bridge the gap between the two cultures is to create structures in which faculty and students confront specific major issues concerning values and technologies that are complex yet pressing. That way, everyone is required to learn a reasonable amount of the empirical details, the value choices and the social factors involved.

Let us now turn to the more immediate problems of raising the students' level of sociological awareness. There is clearly a need for improvement in several areas, and some possible methods have already been discussed. We plan to spend less time in the faculty workshops having presentations by consultants, and to spend more time in discourse with each other about the basic assumptions and insights of the diverse desciplines. We will also need to make hard decisions about course content.

In conclusion, we wish to address a topic that interests a wide range of sociologists: how can we improve small-group discussions. We consider discussion groups in some detail, because they are, we believe, our weakest link, and yet they are potentially most effective. The following improvements will be helpful: (a) on the days that exams are handed back, discuss the strengths and weaknesses of the exam answers and topics. On this occasion,

students' interest in the topics will be intense (at least for the purpose of knowing their grades!) and their knowledge reasonably detailed and well-organized; (b) when a movie is shown or a guest speaker invited, have discussions follow immediately, while the interest and imagination of students are very alive (they are usually very stimulated by such events); (c) perhaps occasionally rotate faculty members to each other's discussion groups, so that the discussion group led by the sociologist meets once in the semester with the scientist or engineer, and with the historian. This will enable interested but shy students (who are numerous at working-class institutions like the University of Lowell) to question instructors other than their "own" in a setting less threatening than the full class meeting. It will also provide a stimulating change of pace (and faces); (d) occasionally, have students engage in group projects that may last over several discussion-group meetings. For example, at one meeting one of us played a simulation game about world food shortages. This was instructive and entertaining, but it would have been even more instructive had it been followed the next week by a variant of the game in which the green revolution was introduced. Another possibility is for students to collect and compare the mass-media reports on energy as prepared by utility companies, consumer/environmental groups and government. When students work in small groups on such projects, the instructor should ensure that where possible, the small groups contain students majoring in both scientific/technical and humanistic fields.

These ideas are merely suggestions. They all have the great merit of costing nothing. Suggestions (c) and (d) clearly take advantage of the inter-disciplinary nature of our courses. We feel strongly that we must start with

modest pedogogical innovations such as these, if our students and indeed all citizens are to really understand that all technologies have social causes and consequences.. Perhaps most important, these causes and consequences are often both latent and controversial. Above all, we wish to impart the concept that technology is not an autonomous force.

## FOOTNOTES

1. One of us (J.M.) has for several years taught both introductory sociology to classes consisting mainly of engineering and science majors, and sociology of health courses to classes with many health education, health administration and biology majors.

2. To the extent that we use distinctively sociological language and concepts in spelling out these assumptions, we are erecting intellectual boundaries and narrowing our perspective. This has been a legitimate criticism of much conventional sociology. But we consider the introduction of a special and somewhat rigorous language essential if our students are to go beyond verbalizing and writing mere cliches and opinions. In addition, as we point out below, we apply our two assumptions to previous historical eras to long-run historical trends, and to specific fields of science and technology. In this way we seek to go beyond the traditional sociological perspectives in our own contributions to these courses, and thus hope to avoid sociological imperialism. (cf. Bourch, 1977).

3. See for example the discussion of alternative transportation policies and their efficiencies and costs in Commoner, 1976: 170-83.

4. The scorn for science which Snow (1959) found among liberal-arts specialists in Britain was nowhere in evidence among our students, even among upper classmen in social sciences or humanities. Perhaps this reflects the difference between American and British culture on these matters as well as the relatively low socio-economic status of most of our student and their general lack of intellectual self-confidence on all topics.

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# APPENDIX

Course Syllabi

Sample Examinations

Student Evaulation Form

UNIVERSITY OF LOWELL

TECHNOLOGY AND HUMAN VALUES I & II

These are team taught courses concerning the interrelationship between technology and human values. Team members represent both physical and social sciences. Major questions include: Are science and technology value free? Do values cause technological changes or the reverse? Selected topics will be studies in depth.

*Fall, 1979: Man and Nature (59-203)

Time Schedule - South Campus -Mon.-Tues.-Thurs. -10:00am.-CO303
North Campus -Mon.-Tues.-Thurs. -10:30am.-B1214

I Food: Enough to Feed the World?

Agriculture and society since the middle ages, American agri-business, the green revolution and food aid in the "Third World."

II The Scientific Revolution: Man Discovers the Macro Universe.

Galileo, Newton, Einstein, Structure of space and time, theory of relativity, operational definition.

III Energy: Running Out of Gas.

Power in the Victorian age, fossil fuels, nuclear energy, sustainable alternatives and the environment, effects on consumbption and life styles.

*Spring, 1980: Man and Society (59-204)

Time Schedule - South Campus -Mon.-Tues.-Thurs. -2:00pm.-WELH3
Apfelbaum, MacDougall, Liebowitz - Mon.-Wed.-Thurs.
North Campus -Mon.-Tues.-Thurs. 10:30am.-BL214
Baker, Kolach & Lipchitz

I The Industrial Revolution: Slavery and Freedom.

The factory system, work and social class, the Lowell system and its development, poverty or prosperity, post-industrial society.

II The Genie is Out of the Bottle: Man Discovers the Micro-Universe.

The world of quantum mechanics, atomic and nuclear structure, fission and fusion, electronic computers, war and annihilation, arms control and disarmament.

III The Family: Does it Have a Future?

The family in industrial society, women's role, birth control, population pressures.

IV Health and the Biological Revolution.

Disease and death, DNA research, genetic engineering, medical science, who controls, who benefits.

*These courses meet distribution requirements in Area I (Social Sciences) and are freshman-sophomore level.

Dr. Shirley Kolack, Sociology, is Coordinator for the courses.

NORTH

I Introduction: Values (Sept. 4-10)
Baker, prologue, Ch. 1
White, Ch. 1-2.

II The Scientific Revolution: Man Discovers the Macro-universe
(Sept. 11-Oct. 11)
Baker, Ch. 4-11 Lectures: Sept. 11, 17, 18,-Lipchitz
White, Ch. 6 Sept. 24, 25, Oct 2, 9, Baker

III Energy: Running Our of Gas (Oct. 15 - Nov. 8)
Commoner, & Additional Handout
Oct. 15, 16,22,23 - Anfelbaum
Oct. 29, 30, Nov. 5 - Kolack

IV Food: Enough to Feed the World: (Nov. 12-Dec. 3)
Lappe and Collins, selections to be announced.
McNamara, handout Nov. 12, 13, 19, 20 - Lipchitz
Nov. 26, 27, Dec. 3 - Kolack

V Man and Nature: An Ecological Perspective (Dec. 4-11)
White, Ch. 4-5, 7-10
Commoner, review Ch. 9

Books to Purchase:

A. Baker, Modern Physics and Anti Physics

B. Commoner, The Poverty of Power

C. Lappe & Collins, Food First

D. L. White, Jr. Dynomo and Virgin Reconsidered

North Campus Team:

Dr. Shirley Kolack (Sociology)
Dr. Adolph Baker (Physics)
Dr. Joseph Lipchitz (History)

SOUTH

I Introduction: Values (Sept. 4-10)
Baker, prologue, Ch 1
White, Ch. 1-2

II Food: Enough to Feed the world? (Sept. 11 - Oct. 11)
Lappe and Collins, selections to be announced
McNamara, handout
Lectures Sept. 11, 17, 18 - Liebowitz
Sept. 24, 25, Oct. 2, 9
MacDougall

III The Scientific Revolution: Man Discovers the Macro-Universe
(October 15-November 8)
Baker, Ch. 4-11
White, Ch. 6
Lectures Oct. 15, 16, 22 - Liebowitz
Oct. 23, 29, 30, Nov 5 - Baker

IV Energy: Running out of Gas (Nov. 12 - Dec. 3)
Commoner, and additional handout
Nov. 12, 13, 19, 20 - Anfelbaum
Nov. 26, 27, Dec. 3 - MacDougall

V Man and Nature: An Ecological Perspectives (Dec. 4-11)
White, Ch. 4-5, 7-10
Commoner, Review Ch. 9

Books to Purchase:

A. Baker, Modern Physics and Anti Physics

B. Commoner, The Poverty of Power

C. Lappe & Collins, Food First

D. L. White, Jr. Dynomo and Virgin Reconsidered

South Campus Team:

Dr. Jack Apfelbaum (Industrial Technology)
Dr. Jonathan Liebowitz (History)
Dr. John MacDougall (Sociology)

59,203
Technology & Human Values I
Fall 1979

FINAL EXAM - Due December 17, by Noon

Suppose you are advising a presidential candidate. Write a background briefing paper for the candidate about:

1) What America's energy policies should be in the 1980's.
2) Why the U.S. should adopt those policies.

In the Course of you answer discuss,

A) Different sources and uses of energy
B) The role of conservation

and

C) The effects of your policies on the environment

Your answer should be four double-spaced, typed pages.
Return you answer to you section instructor-

Professor Apfelbaum: Pasteur 111, North Campus
Professor Liebowitz: Kitson 214, North Campus
Professor MacDougall: Coburn 404F, South Campus

Final grades will be posted as arranged by your section instructor.

59.204
Spring 1978
Technology and Human Values II: Contemporary Challenges

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INSTRUCTORS

Robert Innis, Philosophy (Sec. 201)
Joan Rothschild, (Politics Sec. 202)
Jonathan Liebowitz, History (Sec. 203)
Shirley Kolack, Sociology (Sec. 204)

ORGANIZATION OF COURSE

All students will attend lectures in BL210, and sections in the individual classrooms designated. There will be at least three essay type examinations based on reading assignments and lecture materials.

BOOKS AND PAMPHLETS

Assignments will be drawn mainly from the following books and pamphlets, which are available at the North Campus bookstore:

Aldous Huxley, Brave New World (Scranton, Penn: Harper & Row, 1969)
Richard Sennett & Jonathan Cobb, The Hidden Injuries of Class (New York: Vintage Books, 1973)
Eric Remarque, All Quiet on the Western Front (Greenwich, Conneticut: Fawcett, 1974)
Barry Commoner, The Closing Circle (New York: Bantam, 1972)
Technology & Man's Future, ed. Albert Teich (New York: St. martin's Press, 1977)

Pamphlets

Margaret Benston, The Political Economy of Women's Liberation (Sommerville, Mass: New England Free Press)
Juliet Mitchell, Women, The Longest Revolution (Sommerville, Mass: New England Free Press)
Democratizing the Workplace, a kit of materials (Campbridge, Mass: American Friends Service Committee)

COURSE OUTLINE AND ASSIGNMENTS

1. Introduction: Technology and Human Values: Concepts and Dimensions (January 23 - 26)

   A. Philosophical
   B. Historical
   C. Political
   D. Sociological
   E. Frameworks and Perspectives

   Assigned Readings
   Huxley: Brave New World

2. The Family: A Case study of the Impact of Technology on Key Institutions. (January 30 - February 16)

Assigned Readings

Benston, The Political Economy of Women's Liberation
Mitchell, Women, The Longest Revolution

3. Work, Social Class and Leisure: (February 21 - March 16)

Assigned Readings

Sennett and Cobb: The Hidden Injuries of Class
Democratizing the Workplace, American Friends Service Committee

SPRING RECESS March 17-26

4. War and Its Consequences (March 27 - April 6)

Assigned Readings

Remarque: All Quiet on the Western Front

5. Ecology and the Environment (April 10 -20)

Assigned Readings

Commoner: The Closing Circle

6. Technology and Our Future (April 24 - May 16)

Assigned Readings

Note: Assignments from Technology and Man's Future Ed. Albert Teich will be named throughout the course.

Lectures will be given by the faculty designated on the following dates:

Liebowitz: Jan. 30, 31, Feb. 6, March 27, 28, April 3 & May 15.

Kolack: Feb. 7, 13, 21, 27, 28, March 6, and May 16.

Rothschild: Feb. 14, March 7, 13, April 18, May 2, 8, and 9

Innis: March 14, April 4, 10, 11, 24, 25 and May 1

59:204
Technology and Human Values

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First Examination, Due on Monday, March 13, 1978.

Instructions: All Papers should be typed - Double Spaced.
A minimum of four pages, a miximum of six.

Quotation from Herbert Marcuse, "The New Forms of Control",
Page 113 in Albert Teich, ed., Technology and Man's Future.

".....In the contemporary period, the technological controls appear to be the very embodiment of Reason for the benefit of all social groups and interests -- to such an extent that all contradiction seems irrational and all counteraction impossible".

In the light of the above quotation describe the two systems of rankings presented in Brave New World and The Hidden Injuries of Class, and discuss how these systems are connected to technology and to value systems. Deal specifically with Mustapha Mond's justification (Chapter 16) of Brave New World's ranking system and Sennett and Cobb's criticism of the ranking systems described in their book.

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Technology and Human Values

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Second Examination, Due on Monday April 24, 1978.

Instructions:

All papers should be three pages. They are to be typed-double spaced.

Answer only one of the two questions listed below. Do not answer both.

Question 1

Is technologically advanced war the ultimate pollution?

Question 2

Discuss the place of science in developing new weapons for war and polluting technologies. Do such activities invalidate the discussions of scientists "working methods" presented by Steven Weinberg in "Reflections of a working scientist?"

Note:

Which ever question you select be sure to relate specifically to class discussions and assigned readings.

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Technology and Human Values

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Third Examination, Due on Wednesday, May 24, 1978.

Instructions: All papers should be four or five pages.
They are to be typed-double spaced.

The Question:

What would be the consequences of rearranging the world as Illich recommends? Why would one need special "tools for conviviality"? Are Illich's proposals, in your opinion, feasible? Why or why not?

Refer as well to the other readings assigned in the seciton on the future to support your reasoning.

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Technology and Human Values 1

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Third Exam, Due on Tuesday, December 19 by 3:00 pm.

Please Note: Leave your completed exam in your instructor's mailbox in Kitson 214.

Instructions: Answer the following question in a well written essay. The essay should be four pages, typewritten, and double-spaced.

Question:

Select:

a) Two major values you hold, i.e. ideas about what is good and important.
b) One technological change (a specific new technology) or (a package of new technologies) discussed in the course, which you think was major.

Did or will the technological change make it easier to attain the two values you selected for the people affected by it?

In the course of your answer, be sure to refer to:

(1) Specific social groups and institutions affected by the technological change.
(2) Specific readings and lectures including Huxley and Commoner.

Technology and Human Values
Fall 1978

FIRST EXAMINATION

Instructions

Your answer should be four pages, typed and double-spaced. It is due October 13. In your answer, be sure to refer to lectures and readings.

Question

Compare the social organization of food production in medieval Europe and the contemporary world. In particular, discuss the extent to which the major values or the main technological changes of the time serve/served the political and economic interests of the groups that dominate the process of food production and distribution.

NOTE: In your discussion of the contemporary world, make clear to which country or region you refer.

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Technology and Human Values Hour Exam #1
Dr. Linchitz

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Answer the following question in a well written essay of four typewritten, double-spaced pages. Your essay is due in class on October 22. Be sure to include you name, discussion section number and discussion section instructor.

Drawing upon assigned readings and lectures compare the operational principles, and values of the classical scientific revolution with those of the modern scientific revolution. In your discussion explain how modern scientific revolution led to the concern of the operational definition. Give two of your own examples of operational questions and two of your own examples of non-operational questions.

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Technology and Human Values Exam 2

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Answer the following question in a well written essay of four typewritten double-spaced pages. Your essay is due in class on Monday, November 26. Be sure to inclued you name, discussion section number and discussion section instructor.

Barry Commoner states as the fourth law of ecology that "there is no such thing as a free lunch". (from the Closing Circle) Page 41.

Interpret this statement both historically and in the context of present and future energy policies for the United States. How will future political, economic and technological decisions affect your life style in the years 1985, 20007. In your discussion draw upon assigned readings and class lectures.

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Technology and Human Values Exam 3

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Instructions:

Answer the following question in a well written essay of four typewritten, double spaced pages. Make arrangements with your discussion section instructor for the time and place to leave your examination. Be sure to include your name, discussion section number, and discussion section instructor.

Lappe and Collins state "We are all in a common struggle for control over the most basic human need - Food". (From Food First)

This struggle does not manifest itself si directly in the United States as in other parts of the world. How do American food policy and food production affect this issue? In your discussion draw upon assigned readings and class lectures.

STUDENT EVALUATION QUESTIONNAIRE FOR TECHNOLOGY AND HUMAN VALUES COURSE

Use a #2 pencil and mark answers on both the computer card and the questionnaire. Do not sign.

_____ 1. Your College:

A. Health Professions
B. Education
C. Engineering
D. Liberal Arts
E. Management
F. Music
G. Pure and Applied Science

_____ 2. Your year: A. Freshman B. Sophomore C. Junior D. Senior

For the remainder of the questions, please use the following choices:

1. Very Positive
2. Positive
3. Neutral
4. Negative
5. Very Negative
6. No Opinion
7. Not Applicable

_____ 3. How would you rate the adequacy of the professor's grasp of the course material?

_____ 4. How well does the professor stimulate interest in the material?

_____ 5. How would you rate the professor's ability to answer questions?

_____ 6. Does the professor present the material coherently?

_____ 7. How significant is the contribution of the classroom experience to your understanding of the course material?

_____ 8. Does the instructor use examples and illustrations effectively?

_____ 9. How interesting is the material?

_____ 10. How reasonable are the course requirements?

_____ 11. To what extent have you been able to think out, within the context of this course, the answers to your own questions?

_____ 12. How helpful are the professor's criticisms and comments on papers and tests?

_____ 13. How highly would you recommend this course to a friend?

_____ 14. To what extent has this course helped you to locate yourself in a larger cultural, historical or intellectual context?

_____ 15. Would you like to take another course from this professor?

_____ 16. Instructor?

Please answer the following questions. Use the back of the paper if you need more space.

1. What did you like most about the course?
   a. in terms of course content (reading material, lecture topics, etc.)

   b. in terms of course format (exams, papers, discussions, etc.)

2. What did you like least about the course?
   a. in terms of course content

   b. in terms of course format

3. What changes would you make in this course?

4. How, in general, would you rate this professor? (Strong points, weak points?

5. What is the most significatn thing you learned in this course?